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ABSTRACT

Three groups of students were analyzed to determine if academic and nonacademic variables would discriminate between students who graduate with honors, those who graduate without honors, and those who drop out of college. Criterion groups were composed of male students from Brown University who entered in 1962, 1963, and 1964 and graduated in 4 years, and those of the same entrants who had dropped out of Brown. A stepwise multiple discriminant analysis program based on academic and nonacademic variables was used to analyze data. The academic variables were secondary school rank in class (HSR), verbal scholastic aptitude (SAT-V), mathematical scholastic aptitude (SAT-M), and the average of College Board Achievement Tests. The nonacademic variables were based on four sets of high school counselor ratings of motivation and academic promise summed up to form an Admission Index and a socioeconomic index called the Environmental Index. Results indicated academic variables were found to be important for distinguishing between graduates with and without honors, while the nonacademic variables were found weakly but significantly to separate regular graduates from dropouts. A 22-item bibliography is included. (MJM)

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E. Nicholson

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ABSTRACT

Three groups of students were analyzed to determine if academic and nonacademic variables would discriminate between students who graduate with honors, those who graduate without honors, and those who drop out of college. Academic data distinguished graduates with honors from graduates without honors. However, academic variables did not discriminate between students who graduated without honors and students who dropped out although nonacademic variables such as motivation and background did. The various factors related to the completion of 4 years of college are discussed.

PREDICTORS OF GRADUATION FROM COLLEGE

Everard Nicholson[1]

First semester or first year college grade point average (GPA) has traditionally been used as an intermediate criterion of college success. GPA is a convenient objective measure and first year GPA is available soon after college entry. However, first year GPA is seldom promoted as the ultimate criterion. In fact, even GPA after 4 years of college has been shown to have limited usefulness in predicting later life success. Hoyt (1966), in a review of several studies, concluded that academic success in college had only modest correlation with adult success. Several authors (e.g., Holland, 1961; Holland & Astin, 1962; Wallach & Wing, 1969) have shown that grades and academic ability represent only one type of personal competence and have little relationship to other types of competence and creativity. Nicholson (1970), in a study of liberal arts students, found that graduation itself was a key to further success; whether a student were of higher or lower verbal ability, once graduated the probability of achieving success by reputation 15 or more years beyond graduation was about equal.

These studies suggest the need to learn more about the prediction of graduation from college as a criterion of college success rather than college GPA. Graduation as a criterion is especially relevant at a time when many colleges are implementing dichotomous grading systems such as Pass-Fail. In addition, the graduation criterion allows us to examine the students who never finish college (the dropouts) whereas these students are usually lost to the GPA prediction study.

For most colleges, graduation is at least partly a function of GPA. Consequently, academic predictor variables which relate to GPA are likely to be related in some way to graduation. However, factors other than academic ability may affect whether a young person graduates. The need for a multidimensional domain of predictors is well recognized today (Abe, et al., 1965; Astin, 1964; Baird, 1969; Harmon, 1966; Hoyt, 1968; Lunneborg & Lunneborg, 1964; Nichols, 1966; Nicholson, 1970). Therefore, here we consider the relation of nonacademic predictors of graduation as well as academic variables.

The purpose of this paper is to examine the use of academic and nonacademic variables to predict the important criterion, graduation from college. In order to examine the possibly different roles of academic and nonacademic variables, three groups of students were examined: those who graduated with honors, those who graduated without honors, and those who failed to graduate or who dropped out. By studying the predictor variables which differentiate the three groups, it is hoped that a clearer understanding of the role of academic and nonacademic variables in college success can be achieved.

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[1]This paper was completed while the author was an American College Testing Program Summer Postdoctoral Fellow. Currently Nicholson is assistant superintendent of Public Schools in Coventry, Rhode Island.

Method

Subjects

Criterion groups were composed of male students from Brown University who entered in 1962, 1963, and 1964 and graduated in 4 years (1966-1968), and those of the same entrants who had dropped out of Brown. Eliminated from the sample were 5-year program students and those who for sundry reasons had withdrawn and then returned. Two hundred and thirteen of these students graduated with honors, 1,107 graduated without honors, and 292 were dropouts at the time of this research.

Predictor Variables—Nonacademic

Four sets of high school counselor ratings of motivation and academic promise found in the secondary school report of the "Ivy League" admission form were summed to form an *Admission Index* (AI) (Nicholson, 1970). The premise underlying the creation of AI was that success may well be related to the impression that is made upon those in a position to advance an individual. Ideally counselor ratings are the synthesis of the opinions of several people who have worked with a student over a period of time.

A socioeconomic index, called the *Environmental Index* (EI) (Nicholson, 1970), was derived from 12 items pertaining to type of community; the education and status of both parents; desire for dramatic, literary, and debating activities; liking for contact sports; financial need; and need for work. The use of EI is supported by studies which showed that such data are sometimes better predictors of academic success than more subtle personality scales (Astin, 1964; Brown & Dubois, 1964; Lunneborg & Lunneborg, 1966). Further, the very nature of such information provides a valuable different description of a student which is not available from traditional measures.[2]

Predictor Variables—Academic

Four academic variables were used: secondary school rank in class (SSR), verbal scholastic aptitude (SAT-V), mathematical scholastic aptitude (SAT-M), and the average of College Board Achievement Tests (CBAT). SSR was calculated from the quotient of rank and class size with a correction for continuity, then converted to standard scores. SAT-V and SAT-M were tests of the College Entrance Examination Board. CBAT was the average of an applicant's highest scores on all achievement tests submitted (at least three are required). Such a variable may be considered to be an index of maximum performance reflecting the field interest of an applicant since the candidate has considerable discretion in choosing tests most favorable for him or her. It would be expected to have properties uniquely different from both GPA and SSR and to be superior to SSR for students coming from highly selective or intensive school situations. All standard scores were reduced to two digits.

Analysis

The aim of this study was to analyze academic and nonacademic variables for the property individually and interactively to separate groups defined by those who graduated with honors, graduated regularly, or dropped out of college. Sampson's (1970) stepwise multiple discriminant analysis program was used to analyze the data.

Dependent variables were examined first for the property individually to separate (g) groups (df = g - 1, n - g) prior to the selection of the best variables. The stepwise procedure was then used to select a variable at each step (r) choosing first the one with the highest F statistic, analyzing the remaining variables for the best variable to enter, subject to the constraint that its F statistic was significant (df = g - 1 and n - g - r), and removing any variable whose F statistic by virtue of interaction ceased to be significant (df = g - 1, n - r - g + 1) (Cooley & Lohnes, 1962).

At each step, in addition to an approximate F test of equality of group means, the square of the Mahlanobis distance between each pair of groups was calculated.[3] F values for testing these differences were computed (df = 1 and n - g - r + 1) The final set of variables was those to which the addition of further variables from the remaining subset resulted in an F statistic short of significance. This was not necessarily the "best" set. However, it is reasonable to assume that the outcome closely approximates a best set. Huberty (1971) determined that the stepwise procedure yielded the best results of four procedures for ordering variables with respect to their contribution to discrimination.

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[2]For a very useful discussion of this topic, see Abe et al., 1965.

[3]A discussion of the Mahlanobis D^2 is found in Cooley (1971).

After the last step, that is, when all remaining variables failed the F test to enter and all included variables passed the F test for removal, coefficients of the canonical variables were derived. Eigenvalues explained the amount of dispersion accounted for by each canonical variable. When the first canonical variable accounted for a very large proportion of the trace, it alone was considered.

Three sets of analyses were conducted for the following groups:

1. Graduates with honors versus graduates without honors versus dropouts.
2. Graduates with honors versus graduates without honors.
3. Graduates without honors versus dropouts.

Results

Univariate statistics for comparison of the three groups are found in Table 1. Although significant F values for the differences between three means were found for all variables, it is clear that the separation was most evident between graduates with honors and either of the other groups. Only secondary school rank in class of the academic variables discriminated between graduates without honors and dropouts. A clear and significant trend was found for both AI and EI with a descending order of means corresponding to the three academic levels of achievement, indicating that the nonacademic variables of this study might be predictors of dropouts.

All six variables were introduced into stepwise multiple discriminant analyses of the three groups, and the results are summarized in Table 2. The average of College Board Achievement Tests, indicated by the highest F statistic in Table 1, was the primary separator, followed by secondary school rank in class. Although the addition of SAT-M, EI, and AI added to the between-group variance, it is seen from the results of F tests of differences between pairs of group means that CBAT and SSR were sufficient. In other words, most of the separation was between the honors group and the two remaining groups; and indices of past academic achievement were the most effective separators, overriding the effects of the nonacademic variables.

All six variables were then introduced into stepwise multiple discriminant analyses for the two-group case of honor recipients and other graduates

TABLE 1

Univariate Statistics for the Three Groups

	1 Graduates with honors N = 213		2 Graduates without honors N = 1,107		3 Dropouts N = 292		F between	F between pairs of means		
Variables	Mean	SE	Mean	SE	Mean	SE	all means	1, 2	1, 3	2, 3
SSR	69.40	0.43	63.10	0.22	61.63	0.49	78.11***	138.60***	139.07***	6.70**
SAT-V	66.47	0.41	60.64	0.22	60.35	0.48	60.35***	121.77***	90.51***	0.03
SAT-M	69.14	0.49	65.29	0.22	65.41	0.48	23.56***	47.73***	29.30***	0.47
CBAT	66.75	0.37	60.29	0.19	59.44	0.44	98.17***	190.63***	162.09***	2.32
AI	21.07	0.16	19.44	0.08	18.82	0.19	45.85***	73.30***	76.65***	9.87***
EI	52.13	0.71	49.52	0.30	47.96	0.63	10.37***	11.98***	18.35***	4.41*
df							2, 1609	1, 1318	1, 503	1, 1397

*P<.05; **P<.01; ***P<.001.

TABLE 2

Results from Stepwise Discriminant Analyses for Three Groups: Graduates with Honors, Graduates without Honors, Dropouts

Step No.	Variable entered	Signs	F to enter	df	F between all groups	df	F between pairs of groups ## 1, 2	1, 3	2, 3	df
1	CBAT	+	98.17	2, 1609	98.17	2, 1609	176.04***	155.68***	3.96*	1, 1609
2	SSR	+	32.23	2, 1608	64.54	4, 3216	116.17***	110.39***	5.14**	2, 1608
3	SAT-M	-	10.87	2, 1607	46.90	6, 3214	82.27***	81.77***	5.43***	3, 1607
4	EI	+	7.09	2, 1606	37.08	8, 3212	63.47***	65.33***	5.57***	4, 1606
5	AI	+	4.00	2, 1605	30.52	10, 3210	51.11***	53.85***	5.57***	5, 1605

*P<.05; ** P<.01; *** P<.001.
#Signs of the beta weights of the first discriminant function at final step (trace = 96.8%).
##1 = Graduates with honors; 2 = graduates without honors; 3 = dropouts.

only. The results which are summarized in Table 3 virtually repeat those of the three-group case, as if dropouts did not exist. This is hardly surprising in view of the F statistics found in Table 1. CBAT was again the strongest separator, followed by rank in class. SAT-V replaced AI as a separator, significantly adding to the between-group variance accounted for by other variables, but again the addition seems small. For practical purposes, CBAT, an index of academic achievement in high school, was a sufficient separator of those who would otherwise graduate.

The analysis was similarly repeated for the two groups, graduates without honors and dropouts. The results are summarized in Table 4. The only variables separating the two groups were the two nonacademic variables AI and EI. Although it is seen from Table 1 that rank in class was a significant separator in univariate analyses, it was found in the stepwise procedure not to add the separating properties of AI and EI.

TABLE 3

Results from Stepwise Discriminant Analyses for Two Groups: Graduates with Honors and Graduates without Honors

Step No.	Variable entered	Signs	F to enter	df	F between groups	df
1	CBAT	+	190.63***	1, 1318	190.63***	1, 1318
2	SSR	+	58.07***	1, 1317	128.48***	2, 1317
3	SAT-M	-	11.87***	1, 1316	90.31***	3, 1316
4	SAT-V	+	8.59***	1, 1315	70.27***	4, 1315
5	EI	+	5.35*	1, 1314	57.48***	5, 1314

*P<.05; *** P<.001.
#Signs of the beta weights of the discriminant function at final step (trace = 100%).

TABLE 4

Results from Stepwise Discriminant Analyses for Two Groups: Graduates without Honors and Dropouts

Step No.	Variable entered	Signs	F to enter	df	F between groups	df
1	AI	+	9.87***	1, 1397	9.87***	1, 1397
2	EI	+	4.95*	1, 1396	7.43***	2, 1396

*P<.05; *** P<.001.
#Signs of the beta weights of the discriminant function at final step (trace = 100%).

Discussion

The purpose of this study was to examine the properties of academic and nonacademic data as discriminators among those who would obtain honors at graduation, otherwise graduate, or drop out of college. Academic data were secondary school rank in class, verbal and mathematical scholastic aptitude, and the average of College Board Achievement Tests. Nonacademic data were an index created from counselor ratings of academic motivation and promise and an environmental index of items of a biographical nature.

Academic variables were found to be important for distinguishing between graduates with and without honors, a separation which was apparently more easy to make than others. The lack of the property of discrimination in academic variables to separate regular graduates from dropouts is consistent with the findings of Rose and Elton (1966) that dropouts are like students in good academic standing because many of them leave to become successful persisters elewhere; Heist (1968), that many who leave college have high ability and interest in intellectual matters; Savicki et al. (1970) and Nicholson (1970), that dropouts are not different from successful persisters on predicted GPA.

On the other hand, the nonacademic variables were found weakly but significantly to separate regular graduates from dropouts, and interactively academic variables failed to add significantly to them. The results for the Admission Index suggest that in their judgments, high school counselors added new information about the student rather than repeating academic data. A study by Nicholson (1971) suggests that AI may be largely a measure of the student's motivation. The results for the Environmental Index indicate the importance of background for a student's completing 4 years of college.

The findings of this study have implications for the importance of motivation and background for students successfully to complete 4 years of college and may suggest areas in which colleges need to assist students who are academically able but have other handicaps.

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